The Bureau Central de Météorologie, Rue de l'Université, Paris.

The Meteorological Office, 63 Victoria street, London, S. W.

The Indian Meteorological Office, Calcutta, India.

THE CHEMICAL THERMOSCOPE.

We copy the following from the Scientific American for November 26; it describes the method of making a little instrument that is found in many houses and is frequently called a barometer, or sometimes a "weather indicator" or a chemical hygrometer. Probably all these names are quite inappropriate and misleading. The liquid within the glass is so sealed up that neither the pressure nor the moisture of the external air can have any influence upon it. It is really a form of thermoscope; the changes in the appearance of the liquid within the glass depend upon the temperature only and can have no more connection with future weather than the changes in a thermometer. A great many other combinations of chemicals dissolved in water, alcohol, coal oil, or other liquids can be constructed to show the rise and fall of the temperature, but an ordinary thermometer is, of course, much better. The Editor does not believe that the instrument described below can have any value, either as a thermometer or barometer, hygrometer or weather indicator. In one location or at one season of the year, it will predict clear weather, but a few hours later, when the temperature of the room changes, its own indications will change correspondingly, and it will predict rain or snow. Nevertheless, as many inquiries have been received, asking for the method of construction, we submit the accompanying with the special request that if any of our observers constructs one of these thermoscopes, he will kindly keep a record of its appearance at every daily maximum and minimum temperature for a month or more and study out its value as a weather prophet.

Dissolve 10 grammes of camphor, 5 grammes of saltpeter, 5 grammes of sal ammoniac, in 105 grammes of alcohol (90 per cent) and 45 grammes of distilled water. After filtering, fill glass tubes 2 centimeters wide and 50 centimeters long with this solution, cork up well below and above, seal and fix on boards by means of wire, similar to barometers. The changes of the solution signify the following: Clear liquid, bright weather; crystals at bottom, thick air, frost in winter; dim liquid, rain; dim liquid with small stars, thunderstorms; large flakes, heavy air; overcast sky, snow in winter; threads in upper portion of liquid, windy weather; small dots, damp weather, fog; rising flakes which remain high, wind in the upper air regions; small stars in winter on bright sunny day, snow in one or two days. The higher the crystals rise in the glass tube in winter, the colder it will be.

KITE WORK IN MADEIRA.

According to Nature, 1879, Vol. XX, p. 444, in the Report of the British Association for 1879, p. 63, will be found the Report of the committee on atmospheric electricity in Madeira, by Dr. M. Grabham, who gave himself to the observation of the regular winds and breezes and their connection with electrical phenomena. Of course, the kite was used for this purpose, and Dr. Grabham notes that—

The thinness of the currents of air constituting sea breezes was demonstrated in the bay of Funchal by flying a kite vertically beyond into the true wind blowing in a contrary direction. Abortive attempts were made to bring down the upper electricity through the lower currents. The electricity of the general northeast wind, which is identical with the trade wind, was found on the heights at the east end to be uniformly moderate and positive.

At the approach of the rain clouds at the termination of a period of fine weather, the atmosphere invariably gives increased readings, and no negative observations were recorded.

The kite is specially adapted to the study of the sea breeze, which usually constitutes but a thin layer of air, and should be applied by those who resort to the shores of our oceans and Great Lakes.

PROGRESS IN KITE WORK.

The October number of the Quarterly Journal of the Royal Meteorological Society contains an historical article by Mr. A Lawrence Rotch on the work done at the Blue Hill observatory in the development and use of the kite. In the discussions following this excellent article, Mr. R. C. Mossman gives an account of the work done by Mr. John Anderson, late of Owensboro, Ky., but now residing in Edinburgh, in flying kites at the latter city for meteorological purposes.

Capt. Baden Powell explained the construction and management of his form of kite. Mr. Rotch stated that the Baden Powell kites had been tried at Blue Hill, and that, although they started in a lighter wind than the Hargrave kites, yet they were not sufficiently stable in winds of varying velocity without using side lines, which precluded the attainment of great height.

Mr. R. C. Mossman stated that from work done by Prof. Michie Smith on the summit of Dodabetta, India, it was found that the electric potential on the edge of a dissolving mist is lower than the normal, while in a condensing mist it is higher than the normal. It is proposed to make observations on this point by the use of kites near Edinburgh, in order to ascertain whether the same phenomenon occurs in the free air as on the mountain tops.

ORIGIN OF TORNADOES.

Dr. B. F. Duke, of Pascagoula, Miss., sends an account of a tornado observed by him in April, 1894, possibly at or near that place.

I was located on the edge of a track about a mile and a half wide, within which nearly everything was swept before the wind. It was a cloudy day, and thunder and rain had been observed all the afternoon in the west under very dark clouds. About 6 p. m. these clouds suddenly became very black in one place while everything around the observer was very calm and still. Soon a terrific roaring could be heard in the distance. As it approached, a low stratum of muddy cloud could be seen in the west, flying from northwest to southeast, while another stratum was coming up equally fast from the south, and puffs of wind from these two directions were alternately felt by the observer. All this occurred a little in advance of the dense black cloud, which was streaked with lightning, though not funnel-shaped so far as we could discern. When it (the tornado?) had passed by us, it was seen that the timber on the north side of the track was blown to the southeast while that on the south side fell toward the north, but in the center, or nearly so, it was piled in every direction and in the greatest possible confusion. In some places the wind seemed to have made all sorts of breaks and deflections, blowing in strips of a quarter of a mile or more, directly opposite to the general course which was nearly northeast. In some of these dashes, if we may so speak of them, it (the wind?) would appear to have been heavier than in the main body of the storm.

What conditions of the earth and air give rise to the south and the northwest winds and the clouds that preceded the hurricane?

Is there not a strong attraction between them? When they meet, is not this affinity neutralized? Had these winds been coming from exactly opposite directions, would not the cyclone (tornado) have occurred throughout the whole length at the same moment? Does a tornado actually travel, or is its velocity to be reckoned by the acuteness, or obtuseness of the angle of these two approaching currents, which might be illustrated by two lines of battle advancing toward each other at the angle indicated, namely, one moving from south to north, the other from northwest to southeast; the time required for the two entire lines to meet depending upon the speed maintained?

In the United States when the weather map shows a center of low pressure, there is generally an extensive area of cold northerly winds and high pressure west of the center; but a region of warm southerly winds south and east of it. What conditions of the earth and air give rise to these winds? The only answer must be that the differences in density of different portions of the atmosphere cause these portions to be acted upon differently by the attraction of gravity and by the centrifugal force of the revolving atmosphere. Gravity pulls the denser air down, so that the cold northwest wind underruns and lifts up the warm, moist, southerly wind. Centrifugal force drives the denser cold air toward the equator, pushing the lighter, warm air out of its way, and forcing the latter upward and backward toward the polar regions. These are the principal mechanical conditions that give rise to the winds and clouds that precede such tornadoes as those in northern Mississippi on April 8–9 and 18–19, 1894.

On both these dates a cold, dry, northwest wind was advancing southward over the State as the front edge of an area of high pressure, while warm southerly winds were prevailing everywhere to the southward and eastward. The northwest winds were much stronger than the southerly winds, but they, themselves, did not constitute a tornado, nor could they have done the damage described without another auxiliary process. At the front of the area of northwest wind, where it ran under the south wind and lifted it up, as the nose of a plow lifts and turns the sod, there was formed a cloudy mass due to the rapidly uprising air. The buoyancy within such a cloud is very great. When once well formed, it may suck up the air beneath it with such violence as to form a waterspout over the ocean or a tornado over the land and the winds immediately below it are suddenly and greatly increased. It is these winds under the tornado cloud that do most of the destruction; they start toward the cloud as increasing northwest and south winds on the two sides of the track, but rapidly become deflected into circulating winds, under the cloud, extending sometimes even down as low as the ground itself. The individual clouds and whirls along the front of the northwest wind depend very much upon local irregularities, hills and valleys, rivers and ponds; in some cases there may be a long series of whirls simultaneously existing; at other times only one or two acquire any prominence; again, it may be as suggested by Dr. Duke, that there is an advancing front for the southerly winds as well as for the northwesterly, and that the whirl exists only at the one vertex where these two fronts intersect. All these and other cases may occur; but the last is certainly the least common because there is almost always a steady flow of southerly winds over a very large area of country and the front of the northwest wind is everywhere penetrating this and pushing under it simultaneously so that the southerly front has no independent existence.

We can not agree with the suggestion that there is a strong attraction between the northwest and the south winds, or that there is any neutralization of affinity; the winds represent simply two masses of air driven along the earth's surface by the pushing forces that are at work everywhere in the atmosphere and which are ultimately resolvable into two elementary forces, the attraction of gravitation and the centrifugal force of bodies that revolve with the diurnal rotation of the earth. These two forces will cause warm, moist air to push northward while cold, dry air is pushed southward and the tornadoes start in the narrow belt where the northerly winds push against the southerly.

In many cases a tornado involves a large mass of cloud and may be properly said to move bodily for quite a long distance along the earth's surface, as shown by its path of destruction. At other times a tornado rapidly dies out, but only to be quickly succeeded by another, so that the path of destruction is due to a series of newly-formed successive whirls. The axis of the whirl is oftentimes very much inclined to the earth's surface and it is possible that we may have violent whirls with horizontal axes; but they could not last very long.

METEOROLOGY IN FRANCE.

The Annals of the Central Meteorological Bureau of France for the year 1896 have lately been received at the Weather Bureau Library, published as usual in three volumes, of which the first is devoted to special memoirs and the annual report of the president of the Meteorological Council. From the latter it appears that 18 of the provinces of France publish monthly bulletins, and 34 publish annual bulletins relative to meteorology and climatology. There are 2,045 stations for regular observations, or 1 for every 100 square miles of area, and these have furnished 3,348 special thunderstorm bulletins, which latter have been discussed by Fron, who has, for many years, been devoted to thunderstorm work. The number of thunderstorms reported on each day of the year is given in a table on page 38, from which we take the monthly number as given in the second column of the following table:

Months.	Number of days with thunderstorms.			
	France.	Florida.	Louisiana.	Missouri.
January	4	5	7	1
February	5	8	11	3
March	25	6	12	7
April	25	6	10	23
May	31	22	20	26
June	30	29	24	26
July	31	28	24	26
August	30	31	28	25
September	29	26	19	25
October	29	9	10	13
November	14	8	13	8
December	13	1	7	7
Totals for year	266	179	185	190

The area of France may be taken at 204,000 square miles, or about twice as large as either Arizona, Nevada, Colorado, Oregon or Wyoming; but, of course, it would not be proper to divide the above number of thunderstorm days in France by 2 in order to compare its frequency of thunderstorms with those of these respective States. The only States that approach France in the frequency of thunderstorms are Florida, Louisiana, and Missouri, whose areas are, respectively, 59,000, 41,000, and 65,000 square miles. The number of days on which thunderstorms were reported in these States during 1896 are, for the sake of comparison, given in the above table; they are quoted from page 496 of the MONTHLY WEATHER REVIEW for that year. It is difficult to make any proper comparison between France and these States as to the absolute number of thunderstorm days, but it is proper to compare the annual curves of frequency, and to say that the annual distribution of thunderstorms is much more uniform in France throughout the year, and especially from March to October than it is in any region of the same area on this side of the Atlantic.

This first volume contains also a most important memoir by Prof. Marcel Brillouin on the formation of clouds between contiguous layers of winds; a memoir of 100 pages which the present Editor has undertaken to translate entire for the use of observers and students in America. This memoir can not be successfully condensed; every page contains the solution of some important problem. It represents the first successful effort to apply the views of von Helmholtz and von Bezold to the explanation of innumerable cloud forms and even the exact determination of the conditions under which they originate.

A general idea of the contents of the memoir may be obtained from the list of the titles of the chapters: I. Von Bezold's theory of condensation by mixtures. II. Superposed horizontal layers. III. An atmosphere in convective equilibrium; subdivision into zones; geometrical explanation of von Helmholtz's theory. IV. Mixture of contiguous zones of clear air. V. Mixture of contiguous zones of cloudy air. VI. Contiguous zones that occupy the whole height of the atmosphere; condition of the highest regions. VII. Contiguous zones; clouds of invasion. VIII. Two cloudy zones;